

1. An edge-sealed barrier film composite comprising:

a substrate; and

at least one initial barrier stack adjacent to the substrate, the at least one initial barrier stack comprising at least one decoupling layer and at least one barrier layer, wherein a first decoupling layer of a first initial barrier stack has an area and wherein a first barrier layer of the first initial barrier stack has an area, the area of the first barrier layer being greater than the area of the first decoupling layer, and wherein the first decoupling layer is sealed by the first barrier layer within the area of the barrier layer.

2. The edge-sealed barrier film composite of claim 1 wherein the first initial barrier stack includes at least two barrier layers, and wherein a second barrier layer has an area greater than the first area of the first decoupling layer and wherein the first and second barrier layers seal the first decoupling layer between them.

3. The edge-sealed barrier film composite of claim 1 wherein the edge-sealed barrier film composite includes at least two initial barrier stacks, wherein a first barrier layer of a second initial barrier stack has an area greater than the area of the first decoupling layer of the first initial barrier stack and wherein the first barrier layer of the first initial barrier stack and the first barrier layer of the second initial barrier stack seal the first decoupling layer of the first initial barrier stack between them.

Docket No. VIT 0012 PA

4. The edge-sealed barrier film composite of claim 1 wherein at least one initial barrier stack includes at least two decoupling layers.

5. The edge-sealed barrier film composite of claim 1 wherein at least one initial barrier stack includes at least two barrier layers.

6. The edge-sealed barrier film composite of claim 1 wherein at least one of the decoupling layers is selected from organic polymers, inorganic polymers, organometallic polymers, hybrid organic/inorganic polymer systems, silicates, or combinations thereof.

7. The edge-sealed barrier film composite of claim 1 wherein at least one of the barrier layers comprises a barrier material selected from metals, metal oxides, metal nitrides, metal carbides, metal oxynitrides, metal oxyborides, or combinations thereof.

8. The edge-sealed barrier film composite of claim 1 wherein at least one of the barrier layers comprises a barrier material selected from opaque metals, opaque ceramics, opaque polymers, and opaque cermets, and combinations thereof.

Docket No. VIT 0012 PA

9. The edge-sealed barrier film composite of claim 1 further comprising an environmentally sensitive device.

10. The edge-sealed barrier film composite of claim 9 wherein the environmentally sensitive device is selected from organic light emitting devices, liquid crystal displays, displays using electrophoretic inks, light emitting diodes, light emitting polymers, electroluminescent devices, phosphorescent devices, electrophoretic inks, organic solar cells, inorganic solar cells, thin film batteries, or thin film devices with vias, or combinations thereof.

11. The edge-sealed barrier film composite of claim 9 wherein the environmentally sensitive device is adjacent to the substrate and located between the substrate and the at least one initial barrier stack, wherein at least one of the barrier layers of at least one of the initial barrier stacks has an area which is greater than an area of the environmentally sensitive device and wherein the environmentally sensitive device is sealed by the at least one barrier layer within the area of the at least one barrier layer.

12. The edge-sealed barrier film composite of claim 9 wherein the environmentally sensitive device is adjacent to the at least one initial barrier stack on a side opposite the substrate.

13. The edge-sealed barrier film composite of claim 12 further comprising at least one additional barrier stack adjacent to the environmentally sensitive device on a side opposite the substrate, the

at least one additional barrier stack comprising at least one decoupling layer and at least one barrier layer, wherein a first decoupling layer of a first additional barrier stack has an area and wherein a first barrier layer of the first additional barrier stack has an area, the area of the first barrier layer of the first additional barrier stack being greater than the area of the first decoupling layer of the first additional barrier stack, wherein the first decoupling layer of the first additional barrier stack is sealed by the first barrier layer of the first additional barrier stack within the area of the first barrier layer, and wherein the environmentally sensitive device is sealed between the at least one initial barrier stack and the at least one additional barrier stack.

14. An edge-sealed, encapsulated environmentally sensitive device comprising:

at least one initial barrier stack comprising at least one decoupling layer and at least one barrier layer, wherein a first decoupling layer of a first initial barrier stack has an area and wherein a first barrier layer of the first initial barrier stack has an area, the area of the first barrier layer of the first initial barrier stack being greater than the area of the first decoupling layer of the first initial barrier stack, and wherein the first decoupling layer of the first initial barrier stack is sealed by the first barrier layer of the first initial barrier stack within the area of the first barrier layer;

an environmentally sensitive device adjacent to the at least one initial barrier stack; and

at least one additional barrier stack adjacent to the environmentally sensitive device on a side opposite the at least one initial barrier stack, the at least one additional barrier stack comprising at least one decoupling layer and at least one barrier layer, wherein a first decoupling

layer of a first additional barrier stack has an area and wherein a first barrier layer of the first additional barrier stack has an area, the area of the first barrier layer of the first additional barrier stack being greater than the area of the first decoupling layer of the first additional barrier stack, wherein the first decoupling layer of the first additional barrier stack is sealed by the first barrier layer of the first additional barrier stack within the area of the first barrier layer, and wherein the environmentally sensitive device is sealed between the at least one initial barrier stack and the at least one additional barrier stack.

15. The edge-sealed, encapsulated environmentally sensitive device of claim 14 wherein the first initial barrier stack includes at least two barrier layers, and wherein a second barrier layer of the first initial barrier stack has an area greater than the first area of decoupling material of the first initial barrier stack and wherein the first and second barrier layers of the first initial barrier stack seal the first decoupling layer of the first initial barrier stack between them.

16. The edge-sealed, encapsulated environmentally sensitive device of claim 14 wherein the edge-sealed, encapsulated environmentally sensitive device includes at least two initial barrier stacks, wherein a first barrier layer of a second initial barrier stack has an area greater than the area of the first decoupling layer of the first initial barrier stack and wherein the first barrier layer of the first initial barrier stack and the first barrier layer of the second initial barrier stack seal the first decoupling layer of the first initial barrier stack between them.

Docket No. VIT 0012 PA

17. The edge-sealed, encapsulated environmentally sensitive device of claim 14 wherein at least one of the decoupling layers is selected from organic polymers, inorganic polymers, organometallic polymers, hybrid organic/inorganic polymer systems, silicates, or combinations thereof.

18. The edge-sealed, encapsulated environmentally sensitive device of claim 14 wherein at least one of the barrier layers comprises a barrier material selected from metals, metal oxides, metal nitrides, metal carbides, metal oxynitrides, metal oxyborides, or combinations thereof.

19. The edge-sealed, encapsulated environmentally sensitive device of claim 14 wherein at least one of the barrier layers comprises a barrier material selected from opaque metals, opaque ceramics, opaque polymers, and opaque cermets, and combinations thereof.

20. The edge-sealed, encapsulated environmentally sensitive device of claim 14 further comprising a substrate.

21. The edge-sealed, encapsulated environmentally sensitive device of claim 14 wherein the device is selected from organic light emitting devices, liquid crystal displays, displays using electrophoretic inks, light emitting diodes, light emitting polymers, electroluminescent devices, phosphorescent devices, electrophoretic inks, organic solar cells, inorganic solar cells, thin film batteries, or thin film devices with vias, or combinations thereof.

22. A method of making an edge-sealed barrier film composite comprising:

providing a substrate; and

placing at least one initial barrier stack adjacent to the substrate, the at least one first initial barrier stack comprising at least one decoupling layer and at least one barrier layer, wherein a first decoupling layer of a first initial barrier stack has an area and wherein a first barrier layer of the first initial barrier stack has an area, the area of the first barrier layer being greater than the area of the first decoupling layer, and wherein the first decoupling layer is sealed by the first barrier layer within the area of the first barrier layer

23. The method of claim 22 wherein the first initial barrier stack includes at least two barrier layers, and wherein a second barrier layer has an area greater than the area of the first decoupling layer and wherein the first and second barrier layers seal the first decoupling layer between them.

24. The method of claim 22 wherein there are at least two initial barrier stacks, wherein a first barrier layer of a second initial barrier stack has an area greater than the area of the first decoupling layer of the first initial barrier stack and wherein the first barrier layer of the first initial barrier stack and the first barrier layer of the second initial barrier stack seal the first decoupling layer of the first initial barrier stack between them.

25. The method of claim 22 wherein placing the at least one initial barrier stack adjacent to the substrate comprises depositing the at least one initial barrier stack adjacent to the substrate.

26. The method of claim 25 wherein depositing the at least one initial barrier stack adjacent to the substrate comprises depositing at least one decoupling layer before depositing at least one barrier layer.

27. The method of claim 25 wherein depositing the at least one initial barrier stack adjacent to the substrate comprises depositing at least one barrier layer before depositing at least one decoupling layer.

28. The method of claim 25 wherein depositing the at least one initial barrier stack adjacent to the substrate comprises:

providing a mask with at least one opening;

depositing the first decoupling layer through the at least one opening in the mask; and

depositing the first barrier layer.

29. The method of claim 25 wherein depositing the at least one initial barrier stack adjacent to the substrate comprises:

depositing the first decoupling layer having an initial area of decoupling material which is greater than the area of the first decoupling layer;

etching the first decoupling layer having the initial area to remove a portion of the decoupling material so that the first decoupling layer has the area of the first decoupling layer; and

depositing the first barrier layer.

30. The method of claim 29 wherein etching the first decoupling layer comprises providing a solid mask over the first decoupling layer having the initial area of decoupling material, and etching the first decoupling layer having the initial area of decoupling material to remove the portion of the decoupling material outside the solid mask so that the first decoupling layer has the area of the first decoupling layer.

31. The method of claim 29 wherein the first decoupling layer is etched so that at least one edge of the first decoupling layer has a gradual slope.

32. The method of claim 29 wherein the first decoupling layer is etched using a reactive plasma.

33. The method of claim 32 wherein the reactive plasma is selected from O₂, CF₄, H₂, or combinations thereof.

34. The method of claim 22 wherein at least one initial barrier stack includes at least two barrier layers.

35. The method of claim 22 wherein at least one initial decoupling layer includes at least two decoupling layers.

36. The method of claim 22 further comprising placing an environmentally sensitive device adjacent to the substrate before the at least one initial barrier stack is placed thereon.

37. The method of claim 22 further comprising placing an environmentally sensitive device adjacent to the at least one initial barrier stack after the at least one initial barrier stack is placed on the substrate.

38. The method of claim 37 further comprising placing at least one additional barrier stack adjacent to the environmentally sensitive device on a side opposite the substrate, the at least one additional barrier stack comprising at least one decoupling layer and at least one barrier layer, wherein a first decoupling layer of a first additional barrier stack has an area and wherein a first barrier layer of the first additional barrier stack has an area, the area of the first barrier layer of the first additional barrier stack being greater than the area of the first decoupling layer of the first additional barrier stack, and wherein the first decoupling layer of the first additional barrier stack is sealed by the first barrier layer of the first additional barrier stack within the area of the first barrier layer.

39. The method of claim 25 further comprising depositing a ridge on the substrate before depositing the at least one barrier stack adjacent to the substrate, the ridge interfering with the deposition of the first decoupling layer so that the area of the first barrier layer is greater than the area of the first decoupling layer and the first decoupling layer is sealed by the first barrier layer

Docket No. VIT 0012 PA

within the area of the first barrier layer.

40. The method of claim 22 wherein placing the at least one barrier stack adjacent to the substrate comprises laminating the at least one barrier stack adjacent to the substrate.

41. The method of claim 40 wherein the at least one barrier stack is laminated adjacent to the substrate using a process selected from heating, soldering, using an adhesive, ultrasonic welding, and applying pressure.